eGovernment in Local Government

Challenges and Capabilities

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e-Government in Local Government: Challenges and Capabilities

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Abstract: Public sector organizations are supposed to increase productivity by large-scale investments in IT. This research investigates the municipalities' capabilities to increase productivity through IT investments, and what major challenges must be overcome to do so. The research identifies several problems that reduce productivity gains. These problems persist even though they might seem trivial and easily remedied. They are however symptoms of a more general challenge: Difficulties achieving a proper alignment between IT and organizational processes. This alignment gap is related to the way service production is regulated and organized and the way IT is developed and acquired, the lack of local technology and task control that emerges and the resulting lack of managed coordination between task and technology design.

Keywords: e-Government, Productivity problems, Task and Technology design challenges

1. Introduction

As the demographic and economic situation puts pressure on the public sector in Denmark, the municipalities must deliver more services at lower costs. IT is perceived as one of the solutions to this challenge. Central government expects large productivity improvements through investments in eGovernment solutions. However, investigations (e.g. Ashurst et al., 2008) emphasize that realizing benefits from IT investments is difficult. Whether the expected benefits are actually realized is not even evaluated by the Danish municipalities. Consequently we lack knowledge about the outcome of these investments and the challenges to the realization of the expected productivity improvements. Since this government level employs approximately 500,000 people (10% of Denmark's total population) and is responsible for the major part of public service production, it is relevant to look into the municipalities' capability to exploit and benefit from IT investments in terms of increased productivity, and the problems that they face when attempting to do so. This paper therefore investigates the following research question:

> *What characterizes the municipalities' capabilities to increase productivity through IT investments, and what major challenges must be overcome to do so?*

This paper uses "IT business-value" theory to answer the research question. Though it is not explicitly stated in literature reviews (e.g. Schryen, 2013; Kohli & Grover, 2008; Melville et al., 2004; Dedrick et al., 2003; Devaraj & Kohli, 2000; Soh & Markus, 1995), the focus of IT business-value research is on IT investments in private-sector organizations addressing private sector concerns such as competitive advantage. This paper adapts one of these models for use in a public-sector context in order to address the research question. Public-sector organizations have different concerns from those of private-sector organizations (e.g. Pang et al., 2014): Gaining competitive advantage is less important, and there are other kinds of values such as democratic accountability (e.g. Moon et al., 2014). However, when it comes to using IT as a production technology to increase organizational productivity, our assumption is that many of the same concerns apply across the sectors. The IT business value theory is complemented by eGovernment research that focuses on barriers for eGovernment success in municipalities (e.g. Beynon-Beynon-Davies & Martin, 2004; Dhillon, Weerakkody, & Dwivedi, 2008; Nurdin, Stockdale & Scheepers, 2011) as well as eGovernment research studying barriers on a more general level (e.g. Ebrahim & Irani, 2005).

Most IT business-value research studies the relation between IT investments and outcomes at an aggregate level by quantitative methods and without differentiating between different kinds of investments (Schryen, 2013). This output-oriented research has resulted in important findings and increased our understanding of the relationship between IT investments and benefits at an aggregate level. We know what kind of benefits IT investments might have, but we don't know much about the actual value-creating process (e.g. Schryen, 2013). There is widespread consensus that organizational productivity improvement based on IT investments is mediated by improved process productivity (e.g. Schryen, 2013). This research therefore starts by analyzing organizational processes in the municipalities and then focusing on how the IT investments affect the productivity of these processes from the perspective of the employees and first-level managers. These findings are subsequently explained with an IT business-value model. Section 2 reviews the literature regarding IT business value. Section 3 describes the research process. In section 4 the analysis is presented, section 5 discusses the results, and section 6 concludes and describes the research limitations.

2. Productivity and IT investments

To observe the relation between IT investments and productivity we use the same productivity concept as Brynjolfsson & Hitt (1998): Productivity is the amount of output produced per unit of input. Though the definition is simple it can be difficult to apply because both inputs and outputs can be difficult to quantify and measure. We measure the impact on productivity from IT investments in qualitative interviews with end-users and first-level managers.

While 1980s studies of the relationship between IT investments and productivity were inconclusive or unable to demonstrate a positive impact from IT investments, studies from the nineties (e.g. Brynjolfsson & Hitt, 1998; Lichtenberg, 1995) found that IT investments had a positive impact on productivity. The differences between these results have been attributed to newer and better data, an increased level of IT investment making it easier to distinguish its contribution, better analytical tools, and to the fact that organizations were learning to apply IT more productively (Dedrick et al, 2003). Though the studies typically only included hardware-acquisition costs and none included the costs of non-IT investments in training and process re-engineering etc., it is now an established fact that in general, IT investments do lead to increased productivity (e.g. Dedrick et al 2003).

IT is not deterministic in the sense that it leads by definition to certain values or any value at all – that depends on how it is designed and used (e.g. Davern & Wilkin, 2010; Brynjolfsson & Hitt, 2003; Brynjolfsson & Hitt, 2000). The technology can be used directly as a production technology to improve productivity in organizational processes, but it can also be used for many other purposes. Research has suggested IT might have its greatest impact as a technology for coordination (e.g. Shin, 1997).

Figure 1 illustrates the basic relations between the elements that have an impact on the conversion of IT investments into increased productivity. The model in Figure 1 was developed by Schryen (2013) and is based on four other models: Dehning and Richardson (2002), Dedrick et al. (2003), Soh and Markus (1995), and Melville et al. (2004). The model used here is a simpler version of the original because elements related to competitive advantage and market performance have been left out. Basically, the model claims that increased organizational performance (also productivity) is achieved by using a combination of IT (e.g. buying a new ERP system) and non-IT investments (e.g. redesigning the organizational process to exploit the features offered by the ERP system) to change organizational processes in a way that leads to increased process performance. IT only provides an opportunity for improvement; actual improvement is first achieved when IT is used to do something in a different way. These basic relations are affected by contextual factors on the organizational level (e.g. internal IT management capabilities), industry level (e.g. specific characteristics of public sector organizations) and country level (e.g. laws and regulations) that can make it more or less difficult to achieve the desired performance improvement, as well as factors that create a lag between the investments made and the emergence of performance improvements. For example organizations might experience a decline in performance during and immediately after the implementation of an ERP system and not be able to harvest the improvements before years after the initial investment was made.

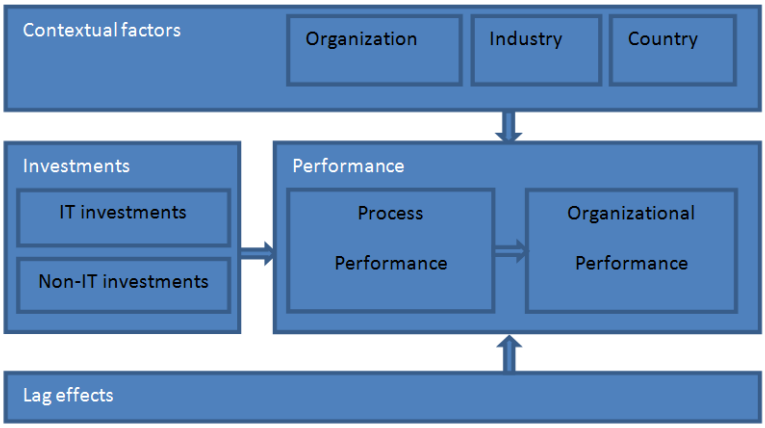

Figure 1: Investments and performance

2.1 Investments

There are two types of investments: IT investments and non-IT investments. IT investments are costs related to the technology itself and human IT resources such as software engineers and IT managers. Most research focuses on aggregate IT investments, i.e. doesn't distinguish between different kinds of IT investments (e.g. replacing outdated computers or implementing a new ERP system) (Schryen, 2013). We know that IT does not create value in itself – it must be combined with non-IT investments such as organizational changes that enable the organizations to exploit the technological possibilities (e.g. Schryen, 2013; Kohli & Grover, 2008; Melville et al., 2004; Wade & Hulland, 2004; Brynjolfsson & Hitt, 2000; Devaraj & Kohli, 2000; Brynjolfsson & Hitt, 1998). Brynjolfsson and Hitt (1998) report that the needed non-IT investments are usually substantially larger than the pure IT investments. The eGovernment literature has identified the following barriers that seem to be especially related to investments:

- Strategy: Unclear and unrealistic visions, goals, objectives and strategies (Veenstra, Klievink & Janssen, 2011; Nurdin, Stockdale & Scheepers, 2011; Ebrahim & Irani, 2005).
- Investment selection: Uncoordinated IT acquisition across departments (Bannister, 2001) and lack of IT investment evaluation methods (Frisk & Ljungberg, 2009).
- Funding: Lack of funding (Beynon-Davies & Martin, 2004; Weerakkody & Dhillon, 2008; Rana, Dwivedi & Williams, 2013; Meijer, 2015; Ebrahim & Irani, 2005) and political, legal and cultural barriers for shared funding and e-government development across municipalities (Beynon-Davies & Martin, 2004).
- IT investments: Insufficient understanding of users (Veenstra, Klievink, Janssen, 2011), excessive focus on technology rather than business needs (Bannister, 2001)
- Non-IT investments: Generally a lack of explicit allocation of resources for Non-IT investments (Beynon-Beynon-Davies & Martin, 2004), lack of participation and collaboration in e-government projects from departments, citizens, employees and politicians (Nurdin, Stockdale & Scheepers, 2011), little reengineering of existing processes and services (Beynon-Davies & Martin, 2004), limited investment in post-acquisition implementation (Bannister, 2001), lack of staff development (Beynon-Beynon-Davies & Martin, 2004; Nurdin, Stockdale & Scheepers, 2011).

2.2 Performance

IT investments can contribute to performance on many different levels. Chang (2000) distinguishes between first-order (process) impacts and higher-order impacts (organizational). Productivity improvements at one level might not necessarily be visible at the next level. A process-level productivity improvement only becomes visible at the organizational level when the saved time is used for something else valuable and when that level is collaborating with other organizations through inter-organizational information systems; the power of the participating organizations determines how the outcome is shared (Melville et al. 2004).

Outcomes from investments are not easily measured. Davern & Wilkin (2010) describe how the value of certain kinds of IT investments (e.g. transformational and strategic initiatives) are especially difficult to measure and how IT investments can be without short-term impact through time lags. It is also difficult to empirically isolate and identify outcomes since many other factors also impact organizational performance (Devaraj & Kohli, 2000).

To summarize across a large sample of organizations, higher levels of IT investment are associated with higher levels of productivity, but IT investments do not automatically lead to increased productivity: Some organizations simply use IT much more productively than other organizations (e.g. Schryen, 2013; Melville et al. 2004; Devaraj & Kohli, 2000; Dedrick et al. 2003; Brynjolfsson & Hitt, 1998). Even when identical systems are implemented in very similar organizations, the outcomes might be quite different (e.g. Orlikowski, 1992). We know that the impact of IT investments on organizational performance is mediated through process performance (e.g. Schryen, 2013; Soh & Markus, 1995; Shin, 1997; Dehning & Richardson, 2002;). The IT business-value literature emphasizes these factors to improve process performance:

- Appropriate use: The most fundamental condition for achieving better performance through IT is that it be effectively applied to the requirements of the relevant tasks.
- Technological and organizational alignment: A necessary condition for appropriate use is a design that establishes a high level of alignment between the technology and organizational characteristics in a broad sense, i.e. a close fit between tasks and IT.
- The combination of investments: How IT and non-IT investments are combined can facilitate change characterized by a high level of technological and organizational alignment.

Productivity improvements depend on appropriate use (e.g. Lucas, 1993; Soh & Marcus, 1995). "Appropriate" implies that the level of usage is optimal and meaningful: More usage might not lead to more or better impacts, and less does not exploit the full potential. Quaadgras et al. (2014) emphasize that a management commitment to "working smarter with information" is a key factor and that this requires both empowerment of individual employees and clear rules and procedures that define the scope within which employees have the freedom to make decisions and act on the information provided by IT.

"Appropriate use" depends on the quality of the design of the technology itself and the complementary organizational changes. Brynjolfsson & Hitt (1998) conclude that organizations benefit most from IT investments when they transform organizational strategies, structures and work practices by means of new approaches that exploit IT better. Several dimensions of the alignment of technology and organizations are emphasized within information systems research: Strategic fit between IT and organizational strategies and goals (e.g. Avison et al. 2004; Grabowski & Lee, 1993), strategic alignment of project portfolios (e.g. Meskendahl, 2010), alignment between organizational processes and IT (e.g. Monarchi et al. 1992; Davenport, 2013; Quaadgras, et al. 2014), alignment between individual work practices, skills and needs and IT (e.g. Lucas, 1993; Soh & Markus, 1995; Norman, 2002; Nielsen, 1994), alignment between incentives and IT (e.g. Markus & Keil, 1994), between organizational culture and IT (e.g. Leidner & Kayworth, 2006), and between social needs and IT (e.g. Mumford, 2000).

Even quite early studies indicated that IT investments combined with re-engineering bettered the outcomes, and it is generally acknowledged that non-IT complementary investments such as restructuring, new management control systems, redesign of processes, employee training etc. positively impacts the organizational outcome of IT investments (e.g. Schryen, 2013; Dedrick et al. 2003; Brynjolfsson and Hitt; 1998). While we know that these non-IT investments are vital, we know very little about the synergy between various kinds of non-IT investments and IT investments (Schryen, 2013). Dedrick et al. (2003) (based on Zuboff, 1988) suggest that the impacts of IT and non-IT investments on processes can be divided into two categories: automation and transformation. "Automation" implies that labor is substituted by IT and that access to the improved information helps employees and managers make better decisions, while "transformation" implies radically redesigned processes that can lead to significantly higher levels of productivity. Regarding the implementation process, Chang (2000) distinguishes between short-term "transaction" (single event) approaches to realizing IT value from IT investments, and long-term "relationship" (multiple event) approaches. The short-term "transaction" approach is often insufficient. In order to fully benefit from IT investments they must be managed over a longer time. The following barriers identified in the eGovernment literature are all related to the organizational processes and the technology supporting these processes:

- Complexity: Complex business processes (Ebrahim & Irani, 2005), complexity caused by co-production (King, 2007), complexity of information systems (Veenstra, Klievink, Janssen, 2011; Rana, Dwivedi & Williams, 2013; Ebrahim & Irani, 2005)
- Fragmentation: Siloed organizational structures (Veenstra, Klievink, Janssen, 2011; Bannister, 2001), lack of integration (Beynon-Davies & Martin, 2004), rigid organizational structures that make service integration difficult (Nurdin, Stockdale & Scheepers, 2011), fragmented or ill-defined decision-making responsibility (Veenstra, Klievink, Janssen, 2011).
- Transparency: Difficulties understanding processes and systems in order to redesign and integrate them (Ebrahim & Irani, 2005), lack of detailed descriptions of business processes (Veenstra, Klievink, Janssen, 2011).
- Alignment: Lack of alignment of ICT to the organization by process redesign (Veenstra, Klievink, Janssen, 2011).

2.3 Contextual factors

We know that contextual factors on the country, industry and organizational levels matter for value creation, but especially the country and industry factors have not been researched sufficiently to provide a clear picture (Schryen, 2013).

The outcome of IT investments depends on individual organizational characteristics that are hard to change in the short run. Some of the most important characteristics are the level of alignment between IT and the organization's core competencies and business planning, the level of upper-management involvement in IT investments (Schryen, 2013) and the presence or absence of organizational ability to combine and manage

non-IT and IT investments: Financial performance is related more to the way IT is managed than to the level of investments (Stratopoulos and Dehning, 2000). Previous research emphasizes the following IT management capabilities: IT strategy (Markus & Soh, 1993), IT project evaluation and selection (e.g. Irani, 2002; Irani & Love, 2001; Bannister & Remeny, 2000; Markus & Soh, 1993), IT project management (Markus & Soh, 1993; Irani & Love, 2001), change management (Irani & Love 2001) including the capability to facilitate employee involvement in the design of the specific systems and how work processes are organized (Hsieh et al., 2011), benefits-realization management (Ashurst et al. 2008), information management (Mithas, 2011), customer management (Mithas, 2011), process management (Mithas, 2011) and performance management (Mithas, 2011). Within eGovernment research the following barriers can be related to the organizational level:

- Management: Insufficient structures for IT management (Beynon-Davies & Martin, 2004; Veenstra, Klievink, Janssen, 2011; Rana, Dwivedi & Williams, 2013), unclear eGovernment responsibilities (Nurdin, Stockdale & Scheepers, 2011), inadequate collaboration between the organization and IT-department: (Veenstra, Klievink, Janssen, 2011).
- Skills: Lack of IT skills and personel (Veenstra, Klievink, Janssen, 2011; Rana, Dwivedi & Williams, 2013; Meijer, 2015; Ebrahim & Irani, 2005).
- Transformation: Lack of awareness (Rana, Dwivedi & Williams, 2013), change management capability (Weerakkody & Dhillon, 2008; Nurdin, Stockdale & Scheepers, 2011), lack of organizational readiness to business process reengineering (Weerakkody & Dhillon, 2008; Veenstra, Klievink, Janssen, 2011), management commitment (Nurdin, Stockdale & Scheepers, 2011; Meijer, 2015; Ebrahim & Irani, 2005), employee commitment (Nurdin, Stockdale & Scheepers, 2011), resilience (Rana, Dwivedi & Williams, 2013; (Meijer, 2015), lack of trust between employees and government institutions (Nurdin, Stockdale & Scheepers, 2011).
- Collaboration: Lack of communication, coordination and cooperation (Veenstra, Klievink, Janssen, 2011; Meijer, 2015; Ebrahim & Irani, 2005).
- Learning: Lack of organizational learning from other similar organizations (Nurdin, Stockdale & Scheepers, 2011), lack of post-implementation evaluation (Bannister, 2001).
- Politics: Political pressure (or lack of) (Veenstra, Klievink & Janssen, 2011; Meijer, 2015), political struggles (Bannister, 2005; Ebrahim & Irani, 2005).

There are only a few studies of the impact of the industry context, but we know that industry characteristics impact on how well an organization can benefit from IT (Melville et al., 2004). Public sector research (e.g. Pang et al., 2014) describes how the conditions for exploiting IT in the public sector differ from those of the private sector. The former has other goals than maximizing profit, and decision-making, accountability systems and stakeholder management are more complex (Almarabeh & Abu Ali, 2010), but we still don't know how these differences affect the possibilities for realizing IT-based productivity improvements in public sector organizations. Within the eGovernment literature the following barriers can be categorized as belonging to this level:

- Public sector culture: (Veenstra, Klievink, Janssen, 2011).
- Collaboration: Establishing partnerships with other municipalities (Nurdin, Stockdale & Scheepers, 2011), lack of synergy between local government, other public sector and private agencies' business processes and IS/IT systems (Weerakkody & Dhillon, 2008; Ebrahim & Irani, 2005).
- Standards: Lack of enterprise architecture and interoperability standards (Veenstra, Klievink, Janssen, 2011; Ebrahim & Irani, 2005)
- Security threats and privacy concerns: (Veenstra, Klievink, Janssen, 2011; Rana, Dwivedi & Williams, 2013; Ebrahim & Irani, 2005).
- Vendors: Difficulties using technologies developed for the private sector in a public sector context (King & Cotterill, 2007), dependency of software vendors for system innovation (Veenstra, Klievink, Janssen, 2011).

The macro-environment at the country level affects the degree to which firms can apply IT to organizational improvement (Melville, 2004). Some of the most important factors at the country level are national regulations and laws, and the technical infrastructure (Schryen, 2013). At the country level the eGovernment literature has emphasized barriers such as:

- Laws and policies: Restrictive laws and regulations (Nurdin, Stockdale & Scheepers, 2011; Rana, Dwivedi & Williams, 2013; Meijer, 2015) supportive policies from central government through the provision of financial, political, and technical infrastructure (Nurdin, Stockdale & Scheepers, 2011).
- Citizens' capabilities and attitudes: Lack of technological facilities, knowledge, competences, interest, and ability to integrate e-Government into daily routines among citizens (Meijer, 2015), lack of interest, little

faith in and negative image of government, no perceived usefulness, resistance towards technology among citizens (Meijer, 2015), digital divide (Rana, Dwivedi & Williams, 2013).
- Infrastructure: Lack of development of basic infrastructural facilities (Veenstra, Klievink, Janssen, 2011; Rana, Dwivedi & Williams, 2013; Meijer, 2015), (Ebrahim & Irani, 2005).
- Coordination: Effective and efficient coordination of e-government between central government and municipalities (Nurdin, Stockdale & Scheepers, 2011; van Os, 2011).

2.4 Lag effects

There can be a considerable time span from the new IT investment to the visible outcome (e.g. Schryen, 2013; Brynjolfsson & Hitt, 1998). This time period and the period that lasts until the organization starts to benefit from these outcomes can differ rather a lot: Some systems have relatively fast payoffs, others realize payoffs only after a longer period of time; some systems have short-term impacts and others, long-term impacts (Dedrick, 2003). However, IT-based value creation is never immediate. The effort needed to adopt, develop and implement IT takes time and this alone creates a lag effect that can be in the order of years (Santhanam & Hartono, 2003). Regarding lag effects eGovernment research indicates that reengineering is especially time consuming in public organizations (Ebrahim & Irani, 2005).

3. Research approach

Most previous research on IT investments and productivity is quantitative and analyzes IT investments at an aggregate level. While this approach has delivered important results, scholars (e.g. Schryen, 2013) have suggested that we need to study IT investments at a more disaggregate level to understand how they actually contribute to increased performance, e.g. in terms of productivity. Therefore the strategy in this research paper is to study the use of IT in individual organizational processes and the impact these systems have on productivity.

The municipalities lack quantitative data both on the input side (in terms of costs) and the output side (in terms of productivity improvements). On the input side the pure costs of buying IT are known, but the costs related to the non-IT investments (e.g. organizational implementation and training) are unknown. As to output, outcomes in terms of productivity improvements are also unknown for several reasons. Generally it is very difficult to objectively quantify the impact from IT investments (e.g. Schryen, 2013). First, the implication of lag effects is that the impact of IT investments first becomes visible years after the initial investment is made (e.g. Brynjolfsson & Hitt, 1998, second, it is difficult to empirically isolate and identify outcomes since many other factors also impact organizational performance (e.g. Devaraj & Kohli, 2000), and third, even a relatively simple concept like productivity can be difficult to measure quantitatively (e.g. Brynjolfsson & Hitt, 1998). Additionally, as one of the involved municipalities explained, evaluating the realization of planned productivity improvements is politically inconvenient because budgets are already reduced by political and administrative leadership. Instead of quantitative data we use qualitative data: end-users' and first-level managers' perceptions of the impact on productivity from IT investments. Perceptual measures of the value of IT investments have been used in similar research the argument being that "*perceptual measures could offer rich and potentially useful insights by identifying the impacts of IT on certain activities in the value chain*" (Tallon & Kraemer, 2006).

The present research was conducted in collaboration between the following types of actors:
- End-users and first-level managers from the municipalities took part in the research with the goal of gaining insight into their own organizational processes, their problems and how these might be solved.
- Master's students took part in the research with the goal of improving their skills in analysis, design and IT-enabled improvement of organizational processes.
- Researchers took part in the research with the goal of educating the participating master students, collecting research data and supporting the participating organizations.

The multiple purposes and organization of this research reflects the overall goals of the university to improve educational programs by having students engage in practical, relevant problem-solving collaboratively with both public and private sector organizations.

There is a strong tradition within systems development of analyzing organizational processes in collaboration with organizational actors. The data collection and initial analysis used the systems-development method known as "Contextual Design" of Beyer & Holtzblatt (1997). Through this method we gained specific insight into the use of IT in these processes, into how it affects productivity as perceived by end-users and first-level

managers, and how it might be improved. The process data was collected and analyzed in a two-step process: First, the individual processes were described and analyzed on the basis of interviews with end-users and by observing actual work practices (e.g. how firefighters used technology). The findings were subsequently presented, validated and discussed at workshops.

Second, the author performed a cross-process analysis attempting to identify common problems across the individual processes.

The first analysis was a collaborative effort involving researchers, master's students, end-users and first-level managers from the municipalities. The interview and observation sessions lasted approximately three hours each (for a total of nine to twelve hours for each process). The results were documented in line with the same standards (work models as described in Contextual Design) across all processes, and the findings were presented and validated at workshops (each also lasting approximately three hours) involving end-users and first-level managers from the municipalities, master's students and researchers.

The interview and observation sessions were conducted as contextual inquiries according to the principles suggested by Beyer & Holtzblatt (1997):

- Context: The interviews were conducted in the users actual workplace. The interviewer watched users do their work tasks (e.g. a senior firefighter documenting an incident) using the existing IT systems and other artifacts (e.g. a calendar or a report) they generated or used during the task. In a few cases real-time observations and interviews of a specific task were practically impossible (e.g. firefighters dealing with a real incident) and interviews were thus based on users re-telling the events.
- Apprenticing: The interviews were conducted following an apprenticing relationship model in the sense that users were encouraged to show the interviewers how they actually performed their work in a similar way that they would use to train a new employee.
- Partnership: Users and interviewers collaborated to understand the users' work in the sense that the interviews alternated between observing and discussing what the users did and why they did it.
- Interpretation: The interviewers shared their interpretations and insights with the users during the interview. This turned out to be very valuable since the users quite typically enriched and corrected the understanding of the interviewers.
- Focus: The interviewers were responsible for keeping the interviews on track. Focus was primarily on a) understanding the specific task and b) identifying productivity impacts (e.g. issues in terms of breakdowns).

Each interview was conducted using three phases:

- Introduction: In good time before conducting the interviews the users were informed about the general purpose, the interview process and issues about recording and confidentiality were resolved. This took place at a joint meeting for all the users involved who worked within the same area. At the beginning of a specific interview the interviewers introduced themselves and made sure that the user had been adequately informed about the interview purpose and process. After this the user would start by providing a high-level overview of the user's work.
- The body of the interview: The interviewers observed the work in accordance with the previously described principles. Typically 3-4 interviewers participated in each interview. One interviewer was responsible for the dialogue with the user, while the others were responsible for taking notes and drawing work models.
- The wrap-up: The interviewers summarized what they learned from the interview, offering the user a chance to make final corrections. As a vital part of the wrap-up interviewers would investigate the representativeness of the task observed and whether there were important variations in the way tasks were performed.

After the individual interviews the interviewers would (without the user) perform an interpretation session to analyze the data. During this session they also developed work models representing the user's activities and documented all the breakdowns identified (productivity issues) in a table. The following work models from contextual design were used:

- The flow model: This model illustrates communication and coordination between people to accomplish work. It also shows how work is divided into both formal and informal roles and responsibilities.
- The cultural model: This model illustrates how culture and policy constrain how work is done and how they work around those constraints to make sure the work is done.

- The sequence model: This model illustrates the detailed steps performed to accomplish each task in a process. It shows the different strategies people use, the intents or goals that their task steps are trying to accomplish.
- The physical model shows the physical environment as it supports or gets in the way of the work. It shows how people organize their environments to make their work easier.
- The artifact model shows the artifacts created and used in doing the work. Artifacts reveal how people think about their work - the concepts they use and how they organize them to get the work done.
-

Each model would also contain a graphical representation of the breakdowns identified with a typical example being inadequate IT support for a specific task in the sequence model. The breakdowns were numbered and described in a simple table:

Number	Description
1	The ODIN system doesn't support the entire incident reporting procedure (e.g. statistics or reporting to waterworks), which means that firefighters must invent their own solutions.
2	There is no way a commander can see that an incident report is ready for approval.

Table 1: Example breakdowns

Working on the models always triggered a need for additional information from the users which was resolved by contacting the users. In some cases this involved getting information from other users than originally interviewed (e.g. a person with a deeper insight into a specific issue). All the individual process analyses in terms of work models and tables with breakdowns were subsequently validated at workshops involving students, the participants from the municipalities, and researchers. Using the above research process Data were as collected and analyzed from 12 different processes in two different local governments from 2011 to 2014 by means of identical methods. LG-2 is among the largest municipalities in Denmark. A large municipality is here defined as one having more than 15,000 employees. LG-1 is a medium-sized municipality with approximately 9000 employees. Some processes were (for practical reasons only) analyzed by several groups of students, others by only a single group. An overview of the processes is provided in Table 1. The processes were selected by the municipalities on the main criteria that the involved employees and first-level managers should be motivated and possess the resources needed to participate.

Local government	Task area
LG-1	Accounting in firefighting (Hansen, J.S. et al., 2014)
LG-1	Approving and monitoring automatic fire detecting equipment (Jensen, B.R. et al., 2014)
LG-1	Incident reporting in firefighting (Askou, N.P. et al., 2014)
LG-1	Checking and maintaining firefighting equipment (Nielbæk, A. et al., 2014)
LG-1	Planning parking control (Kantharooban, P. et al., 2013)
LG-1	Administration of commercial use of public spaces (Kjær, F. & Ballegaard, A.M., 2013)
LG-1	Dispatching, processing and tracking citizen requests (Leegaard, T.P., 2013; Christensen, J.S. et al. 2013)
LG-2	Supervision of daycare (Petersen, M.R., 2012; Bach, A. et al., 2012)
LG-2	Re-allocation of children in daycare (Nielsen, N. et al., 2012; Dalsgaard, P. et al., 2012)
LG-2	Salary processing in daycare (Jespersen, A.S. et al., 2012; Sørensen, R. et al., 2012)
LG-2	Vacation planning in daycare (Nielsen, A.B. et al., 2012)
LG-2	Employee recruitment in eldercare (Vingaard, M. et al., 2011; Bech-Andersen, C. et al., 2011; Nygaard, T. et al., 2011; Andersen, M. et al., 2011; Ulrich, F., 2011)

Table 2: Task areas

The second analysis was conducted by the author. Here the specific productivity-related issues (breakdowns) identified in the 12 individual process analyses were categorized in order to get an overview across all the analyzed processes. The categories were not decided beforehand but emerged from the data. For example the

previously described breakdown number 2 in table 1 ("There is no way a commander can see that an incident report is ready for approval") were categorized under "process organization" that contains breakdowns related to "misalignment between the organization of, and coordination between, process actors and the design of the IT systems".

Finally, having categorized the breakdowns the root causes of these productivity-related issues were identified on the basis of the previously described IT business-value model.

As a part of these workshops the general impact of using the existing systems as well as the root causes to these breakdowns were also investigated. Breakdown number 2 ("There is no way a commander can see that an incident report is ready for approval") from the table is subsequently used as an example. From a technical point of view it is a simple problem. Part of the work previously performed by the firefighters in the municipality is now outsourced to a private company. The private company is responsible for making an incident report in a specific system and the commander in the municipality is responsible for approving the report. The system is however not designed to support this division of work so there is no way that the private company can signal that a new report is ready for approval. As a consequence the commander has to go through all the incident reports to see if some of them need approval. In the same way there is no easy way for the private company to see whether there are issues they need to resolve after the validation performed by the commander. Basically the problem is caused by changes in the way work has been organized since the system was designed. The system is a standard system owned by a national agency and all the municipalities are required to use the system in order to establish a national database regarding various kinds of incidents. However the municipalities can organize the work in different ways and are also free to outsource different parts of the work to private companies. The local municipalities have very little influence on the design of the system, and the national agency responsible for the systems has stopped all further maintenance due to budget cuts at national level. But even if money were available it would be difficult to provide optimal support for the different ways that local municipalities might decide to organize their fire departments. This way, a minor issue that makes the collaboration between commanders and private companies cumbersome becomes very difficult to solve.

4. Analysis

The analysis is structured as our adaptation of Schryen's IT business-value model. First we assess the process performance as experience by local end-users and first-level managers, and then we analyze how IT and non-IT investments are combined. As a part of the analysis, the impact of contextual factors and lag effects are described.

4.1 Process performance: IT usage and its impact on organizational process productivity

To exemplify how IT impacts productivity in organizational processes, a description of one organizational process and the use of IT is provided. The processes as well as the identified productivity-related problems are representative of the entire set of processes that were studied. After this initial description the identified productivity-related problems are summarized across all the other processes.

4.1.1 Firefighters

Firefighters deal with all kinds of incidents besides fires (e.g. traffic accidents, emergencies caused by extreme weather conditions etc.). Besides providing assistance after incidents they are also responsible for preventing incidents e.g. by inspecting buildings to make sure alarms are working and basic equipment to deal with minor accidents is in place. In this section we look at a single process concerning how they deal with information-processing after an incident.

Dealing with incidents can involve many different actors, but at the least, the fire department, the communication and the accounting department in the municipality. Furthermore the local waterworks, the police, a private firefighting company (PFC), citizens and various insurance companies may get involved. During larger accidents volunteer firefighters are also used. Most of the actual emergency assistance is outsourced to a PFC. The PFC receives the emergency calls from citizens. They notify the fire department in the municipality and send the needed people and equipment to the place of the accident. The municipality sends a firefighter from the department who serves as the overall commander at the scene of the accident in collaboration with a senior firefighter from the PFC.

Afterwards the senior firefighter from the PFC is responsible for documenting the incident in a shared system (ODIN), which is mandated by national regulations. The system is owned by a national agency that decided to stop further maintenance and development of the system years ago. When the PFC has made the initial report it has to be checked and approved by the commander from the municipality. If the incident is a fire, the police are responsible for updating the data regarding the cause of the fire (basically to determine whether it is an accident or a crime).

Having approved the incident report, which in many cases means that the commander has to rewrite parts of the report in the ODIN system if he (or she) is unsatisfied with the data quality, the commander has to inform the local waterworks regarding water consumption because the waterworks has to document significant changes in water consumption. This is done by re-entering the relevant information from ODIN in an e-mail to the waterworks. The commander also has to prepare data for various statistics, e.g. regarding whether PFC has responded according to contractual service goals. He (or she) does that by entering data from ODIN into a spreadsheet.

One of the most popular types of information on the municipality homepage is information about these kinds of incidents. The commander manually updates the municipality homepage with ODIN information about the incident, using a standard CMS system.

If the incident has implications that somehow require citizens or companies involved to pay some of the costs (e.g. for a veterinarian needed to put down a seriously hurt animal or a specialist to clean up toxic material), the commander gets another firefighter (the department specialist) to prepare the input for an invoice. If the costs are relatively small, or identifying who is responsible is difficult (e.g. a foreign truck driver), the process stops there because the cost of processing the invoice may be greater than the amount received from the responsible person. When reacting to a false alarm (typically a technical error in automatic fire-detecting equipment in a building), the department specialist has to find the name and address of the company responsible for the alarm because they have to pay the cost. Doing this may be difficult if the information was stored in a mail box or binder by another firefighter in the department.

The input to the invoice based on the ODIN report is prepared manually with word-processing software. It is printed out and manually delivered (with a paper copy of the incident report) to the accounting department. The deliveries are typically made manually once every month. If an invoice needs to be processed fast the commanders place the incident report in a specific place so that the specialist knows it is urgent. Generally though, there is no sense in hurrying because everyone knows that invoices take some time in accounting.

In order to keep track of the invoices the department specialist updates a spreadsheet on his local computer with information about the ongoing invoices. In the accounting department the papers are filed in a binder and typically they stay there for several months. It is not unusual for an invoice to be finally processed six months after the incident. When processing the invoice the employee in accounting re-enters the information (that previously was manually entered from ODIN to the word processor and printed out) into the accounting system. The invoice is now printed out on paper from the accounting system and sent by old-fashioned mail to the citizen or the company, or directly to the insurance company. If the accountant needs further information to complete the invoice, the original commander is contacted.

This way of dealing with a single incident takes months, most of the time nothing happens, and even when something happens a lot of time is wasted. Most of the isolated steps are supported by IT, but not the process as such. The firefighters are not satisfied and experience a range of problems (breakdowns) that reduce their productivity:

- The primary system used to enter incident reports by the PFC doesn't validate the data properly. Sometimes important information is missing and nobody can remember what actually happened This means that the commanders have to use more time than really should be necessary to manually validate the original report from the PFC.
- In some cases more than one municipality is involved in an incident, and because the municipalities cannot share data in one system, incidents might be reported twice.
- None of the systems used by firefighters are integrated. Integration is left to the employees who manually move data from one system to the next.
- Part of the needed data is stored in documents, e-mails and spreadsheets as decided by each individual employee, making it hard for other employees to find and use the data.
- The ODIN systems have functional errors that make the use of the system less efficient.

- The ODIN system has a range of usability issues that make it cumbersome to use and causes the users to repeat the same mistakes.
- The ODIN system doesn't support the entire incident reporting procedure (e.g. statistics or reporting to waterworks), which means firefighters must invent their own solutions.
- Incident reporting involves many different actors who each do a part of the job. The technical systems are not aligned with, and don't support, this specific allocation of work or the coordination between the actors. For example, there is no way a commander can see that an incident report is ready for approval. The commanders and the employees at the PFC therefore decided that using a specific letter in the incident report number means that the report is ready for approval. If the PFC forgets to enter this code the incident report might never be approved. In the same way, the commander can only see that the police have added or changed information by going through the incident reports.

To perform a process in municipal government, e.g. collecting national-level information about accidents, some kind of IT is essential: The task would be difficult without the ODIN system and of course the municipality needs an accounting system. The general attitude among firefighters however is that their productivity suffers because the current IT systems don't support the processes and tasks they are responsible for in an efficient way.

4.1.2 The general picture

The fundamental condition for gaining value from IT investments is "appropriate use" (e.g. Lucas, 1993; Soh & Markus, 1995). Appropriate use of IT is not an objective or quantifiable criterion, but a look across all the studied processes reveals a common pattern: Processes are generally not supported by IT in a way experienced by end-users and first-level managers as satisfactory from a productivity perspective, and it is difficult for the users to modify anything in order to apply the IT more appropriately. Besides some technical weaknesses the primary cause is lack of alignment between, on the one hand, the organizational processes and the individual tasks, and on the other, the IT systems in use. Across processes and municipalities the productivity-related problems (break downs) can be divided into the following categories:

The identified problems seem uncomplicated and should be able to be easily remedied. It is not difficult to integrate two systems, we know how to design user-friendly systems that meet the users' needs, and we also know how to successfully implement new technology in organizations. However, the problems persist. The same kinds of problems have consistently been identified during the period 2012 to 2014. There have been new processes but the same story. The problems were not new when they were documented, but still weren't remedied thereafter, even though all the involved stakeholders had agreed that they affected productivity in the organizational processes.

4.1.3 Technological and Organizational Alignment: Task and Technology Control

Given that the alignment-related problems seem costly but also easy to solve, the interesting question is: Why aren't they more easily remedied? The attempt to answer this question made us focus on two kinds of control needed to achieve a proper level of alignment between, on the one hand, organizational processes and tasks and, on the other, IT systems:

1. Technology control: The organization should be in control of the technology, in the sense that the technology can be adapted to organizational needs and that changes to it are under the control of the organization.
2. Task control: The organization should be in control of the way individual tasks and organizational processes are conducted and changed.

Without task and technology control it is very difficult to systematically make IT-enabled organizational change and obtain a reasonable level of alignment between IT and organizational processes. Even if a proper level of alignment can be achieved initially, the two parts may drift apart when changes in both the task and the technology are outside the control of the organization. A high level of task and technology control is assumed in the IT business-value literature, but this is not the case for the municipalities, as will be explained.

Table 3: Alignment problems between tasks and IT systems

Category	Description
Process organization	Misalignment between the organization of, and coordination between, process actors and the design of the IT systems. The end-users cope with this by inventing their own coordination mechanisms, such as: Placing a printout on the chair of another worker, to mean that it is a high-priority task, or adding a specific number to the information in a specific field in a window to mean that a particular report is ready for approval
Process Information flow	Misalignment between the need for information exchange between process actors and the design of the IT systems. The IT systems supporting a specific process lack integration. This is typically dealt with by printing information out and giving it to the next person, who then enters the information into another IT system, copying data from an IT system into an e-mail and sending it etc.
Process management	Misalignment between the need for process management and the design of the IT systems. The applied IT systems generally do not support management and monitoring of the entire process, for example by providing status information about specific cases. There is little transparency and end-users have to manually check up on process progress, with again some employees inventing their own tracking tools (e.g. spreadsheets with status information about ongoing invoices) to create some kind of overview.
Task scope	Misalignment between the scope of individual tasks and the design of the IT systems. The applied systems typically do not support the entire scope of the tasks. In some cases end-users need additional information and cope by inventing paper-based archives, storing information in spreadsheets, mails, personal calendars and documents; in other cases the end-users need additional functionality e.g. in order to produce statistics, notify other actors, or check whether information is valid.
Task structure	Misalignment between the structure of individual tasks and the design of the IT systems. The user-interfaces are typically not structured to match the structure of the tasks performed by the end-users. Instead, the end-users have to go back and forth between different parts of the system, write down information on paper etc., in order to perform the task.
Task context	Misalignment between the context of individual tasks and the design of the IT systems. A main issue here is that the systems aren't mobile. They are designed to be used at the office but not in other environments. Other typical situations of mismatch are when the systems don't allow end-users to work on several cases at the same time, when there is time pressure (e.g. citizens waiting on the phone while the task is being performed), or when the end-user is frequently interrupted while working on a task.

4.1.4 Task control

Two aspects of task control seem especially important for the specific processes of municipalities: task distribution and task regulation. The processes we have studied are distributed across internal and external organizational boundaries in the following ways, making it difficult to exercise control over how tasks are conducted:

- Task distribution across internal departments: The application of various degrees of centralization and de-centralization within the municipalities can provide different possibilities for task control by decreasing or increasing the number of internal departments that take part in executing and managing a specific process (e.g. firefighters and the accounting department).
- Task distribution across public organizations: Cross-organizational service production within the public sector itself, whereby a specific service is provided through collaborating but independent public sector organizations (e.g. firefighters, waterworks and the police), makes task control more difficult.
- Task distribution across sectors: The outsourcing of selected parts of service-production also implies a lack of control, not only over the outsourced part, but also at the interfaces between the organizations (e.g. firefighters and PFC).
- Task distribution across professional organizations and citizens: The use of volunteers (e.g. volunteer firefighters) also implies lack of control – and in some aspects more than in outsourcing – since the volunteers' contribution is not regulated contractually. The use of "co-creation" and "self-service", involving citizens who produce their own services, also has implications for the level of task control.

A specific process might rely on many different kinds of actors. Some tasks might be performed by the municipality itself (but by different departments); others might be outsourced to various private companies or rely on contributions from volunteers, and they typically depend on cooperation by the citizens or companies that need the service. The large number of relatively independent actors in itself makes task control difficult, but task control is even further threatened by the changes in task allocation over time. What is outsourced

today might be insourced next year or the other way around (this due to changes in political leadership), or another vendor might be chosen instead of the current one. In the same way, what is centralized today might be decentralized next year. Currently, government tasks are being pushed onto the citizens themselves through for example the implementation of web-based services and co-creation, and onto the private sector in terms of outsourcing. Decisions about the use of types of actors in service production (e.g. outsourcing and co-creation / self-service) are politically sensitive and not left to individual department heads.

Service production in the municipalities is regulated by external forces. National level laws, rules and regulations as well as local political decisions define the range of requirements regarding the way tasks are performed and, not least, how they are documented. These laws, rules and regulations are subject to change in ways that can be hard to predict and decided in political processes affording little influence to the people providing the services. The changes might not be decided with operational efficiency in mind, but rather as a response to public and political interests.

Precisely in the example of the firefighters, we can see that many different actors in many different organizations take part and there is no well-defined management structure responsible for the entire process and how well it performs, or that has the authority to change it. Furthermore, the work of firefighting is regulated by rules and policies defined at the national level, for example in the documentation of incidents.

4.1.5 Technology control

Information technology can be developed and acquired in many different ways that afford different possibilities for exercising technology control. In the processes we have looked at we can recognize the following acquisition and development models:

- In-house development: Here, IT systems are developed internally by developers in collaboration with the future users, with the focus entirely on the specific needs of the particular organization. The resulting systems are owned by the user organization. This option potentially provides the greatest extent of technology control.
- Outsourced custom development: Here, IT systems are developed externally by an IT service supplier in collaboration with the future users, with the focus entirely on the specific needs of the particular organization. The resulting systems are owned by the user organization. The level of control is still high, but the user organization is dependent on the service supplier's capability to deliver the appropriate system.
- Community-based development: In order to share development costs, several organizations with similar needs (e.g. municipalities) establish a formal collaboration to develop IT systems that fit the general needs of the organizations. The actual technical development is typically outsourced to an IT service supplier. The resulting IT systems are owned by the community. The level of control is however reduced in the sense that requirements, delivery plans etc. must be agreed upon by the whole community.
- Standard applications: Standard IT systems are acquired "off the shelf" and used. Customers buy the right to use the application, but do not own the application itself. The applications range from packaged software (e.g. word-processing) with limited possibilities for customization, to large and complicated ERP systems that can be tailored to the specific organization. These applications are developed for a mass market and the level of technology control is low.

The municipalities use options 1 and 2 only on a very limited scale – mainly because they are too expensive to acquire – but rely instead on options 3 and 4: The municipalities reduce the cost of getting the technical systems, but also must accept in the bargain a lower degree of technical control and customization. Even though municipalities are quite large organizations, they are also very diverse in the sense that they have a very broad range of tasks e.g. education, eldercare, road maintenance, social services etc. They have many departments that require highly specialized systems for a relatively small number of users, which makes it more difficult to benefit from investments in IT. By EU regulation the municipalities regularly have to invite IT vendors to bid on IT service and system deliveries for the various service areas. This means that central systems (e.g. accounting) are potentially replaceable within a few years, requiring then a re-integration with all the other systems.

Again in the firefighters' case, we can see that there is little local influence on the IT systems in use. The primary system (ODIN) is mandatory. However the national agency stopped its maintenance and further development years ago, and the local departments have no influence on the basic design. Since the time of the original development many changes in task design have been made, such as the outsourcing of specific tasks

from the municipality to private operators, but these changes were not incorporated into the original system design.

4.1.6 Synchronizing task and technology control

Obtaining a consistent level of alignment between tasks and technology depends on governance structures that have the power to exercise both technology and task control, or at least mandate the collaboration between the various actors that are in control. In the processes we have studied this is not the case, with the result that the alignment between technology design and task design, to a large degree, takes place at the level of individual employees without much management interference. The employees find their own way of working and collaborating using the existing systems and other artifacts and tools such as spreadsheets, paper archives, notes and calendars, thereby compensating for the lack of pre-designed alignment between task and technology. Furthermore the employees manually integrate the systems by moving data from one system to another. The best way to generally describe the employees' situation is with the concept of "bricolage" (Lévi-Strauss, 1967) – making the best of the situation by using whatever is at hand. It works, but it is not efficient and the outcome of IT investments in terms of productivity gains seems less than optimal. Technology-and task-design decisions – that ultimately affect the crucial coordination of concrete processes and tasks – are made far away from the end-users and their workplaces.

4.2 The combination of investments

As described in the literature review section, technological and organizational alignment is achieved through combinations of IT and non-IT investments. While the IT investment decisions in the studied municipalities are taken mainly from an acquisition-cost perspective, the complementary non-IT investments are seen from a systems perspective, meaning that implementation projects are framed as systems-implementation projects, not process-improvement projects. A typical example of this: As firefighters were invited to a general-purpose workshop for all employees to learn how to use the functions of a new accounting system, the implications for the organizational processes – in this case for the fire department's duties – were not explained. Generally we found no examples of process-level improvement efforts where IT solutions included all the actors in a specific process in order to improve it. To use the terminology of Zuboff (1988) and Chang (2000), the implementation efforts in the processes studied here can be characterized as "automation" and "transaction": There were no radical transformations of work processes, and implementation efforts were single-event transactions, typically limited to training end-users in the use of the new systems.

One specific organizational factor has great impact on the combination of IT and non-IT investments. As described previously, improvements at the process level might not have any impact on the organizational level. Municipal politicians generally cope with this by simply cutting department budgets pre-emptively so that costs are mitigated. But then the involved departments have fewer resources for non-IT complementary investments, and since the IT has already been bought and budgets reduced, there is little interest among political and administrative leadership to risk an evaluation of whether improvements are actually being realized. The lag between investments and realized outcomes results in increased pressure on the affected departments: They should get more resources during this period to design and implement organizational changes, but they actually lose resources.

5. Results and discussion

In this section we will review our research question and summarize and discuss the results. The research question investigated is:

- What characterizes the municipalities' capabilities to increase productivity through IT investments and what major challenges must be overcome?

From the perspective of first-level managers and employees the productivity gains from IT investments are less than optimal. There are numerous examples of inefficient IT-based processes in the municipalities, as described in the analysis section.

The problems manifest themselves as individual employees' use of bricolage (e.g. inventing personal paper-based archives or spreadsheets, or using systems in unintended ways) in their attempts to design and execute a work practice that compensates for the lack of alignment between the available systems and work processes. These alignment problems can be categorized as task-level alignment problems (e.g. lack of alignment between system structure and task structure) that reduce productivity at the level of individual

employees, and process-level alignment problems that reduce process-level productivity (i.e. they make cumbersome the coordination and information exchange between individuals and organizations taking part in the process).

Comparing the findings in these cases with the previously described barriers we can see that many of these barriers apply here as well and that they contribute to the lack of alignment. This lack of alignment is explained, at least partially, by the way investments are designed, combined and managed. Because of a strong focus on reducing acquisition cost, the municipalities almost exclusively invest in standard systems, over the design of which they have relatively little control. This lack of control and dependency of vendors have previously been identified as a barrier for eGovernment (Veenstra, Klievink, Janssen, 2011). The municipalities are large organizations but also very diverse ones that offer many different services to local citizens and companies. They have many, very specialized domains with relatively few employees, for which it is difficult to establish a sound business case for the development of tailored systems. Such funding related problems are generally acknowledged as a significant barrier for eGovernment (Beynon-Davies & Martin, 2004; Weerakkody & Dhillon, 2008; Rana, Dwivedi & Williams, 2013; Meijer, 2015; Ebrahim & Irani, 2005). The municipalities engage in various shared funding arrangements that deliver standard systems but fail to standardize internal organizational processes as well.

Changing processes is generally difficult because it involves many different actors both within and outside the municipalities. Furthermore it is regulated by external actors (e.g. national-level policies and laws) and local political leadership. As a consequence, local administrative task control is reduced. The major decisions with implications for the design of IT systems and the design of processes and tasks are made in an uncoordinated manner by multiple actors who are relatively distant from the actual work processes. Not only are local task and technology control reduced, there are generally no established local management structures responsible for cross-organizational processes and their support by IT.

This lack of local control increases the need for cross organizational coordination. However, the need for coordination of eGovernment between central and local government (Nurdin, Stockdale & Scheepers, 2011; van Os, 2011), between local government and other organizations that take part in service production (Weerakkody & Dhillon, 2008; Ebrahim & Irani, 2005; Nurdin, Stockdale & Scheepers, 2011), between local governments and IT providers, and between internal departments (Veenstra, Klievink, Janssen, 2011; Meijer, 2015; Ebrahim & Irani, 2005) is not matched by the available IT management structures. This makes it difficult to establish well integrated IT systems and to transform organizational processes. Not only does the involvement of many different stakeholders across organizations make coordination difficult. Another implication is that the need for IT management capabilities is widespread and not isolated to a few organizational units or managers.

As for non-IT investments, the rationale behind them is automation (basically replacing and/or supporting human manpower with technology), not radical process change. This lack of radical change is not uncommon in municipalities (e.g. Beynon-Davies & Martin, 2004). Implementation has a system focus – not a process focus: Users are trained in the systems but process design issues are left to the employees. Just as reported in previous research non-IT investments are inadequate (e.g. Bannister, 2001; Beynon-Davies & Martin, 2004; Nurdin, Stockdale & Scheepers, 2011).

The main characteristic of software is that it technically can be changed relatively easy to fit the context in terms of organizational processes. What happens here is that the institutional context makes it difficult to actually exploit this fundamental characteristic and create a high degree of alignment between IT and organizational processes.

The primary practical implication is that realizing productivity gains from IT investments in the municipalities is difficult. Especially the municipalities should think twice before engaging in IT-enabled organizational change in areas characterized by low task and technology control combined with low IT management capabilities. There is nevertheless in Denmark a strong focus on new technologies and systems to reduce public sector service costs. However, the bigger challenge might not be technical issues, but rather how to create better local control and capabilities so that the technologies and systems can be appropriately exploited.

This research confirms and complements existing IT business-value research and demonstrates how those models (e.g. Schryen, 2013) can be used to understand productivity-related issues in public sector

organizations. By taking a process perspective combined with a qualitative approach, this paper offers some insights into the conversion of investments into value and the problems that organizations face in this domain. Knowing (e.g. Schryen, 2013) that the outcome of IT investments differs across various industries, this paper wanted to identify some of the major factors that impact productivity gains from IT investments in another specific domain.

Task and technology control is taken for granted in IT business-value literature, most likely because that research is empirically grounded in private sector company data. Within that literature there is a great emphasis on the needed capabilities, but not on the possibilities for exploiting these capabilities by exercising technology and task control. However for municipalities this assumption doesn't apply and in fact the lack of control there makes it much more difficult to benefit from IT investments. Since public sector services provided by the municipalities have an enormous impact on our societies, it is vital that IT business-value issues be researched within this context as well, and this paper should provide some knowledge about the problem issues specific to this sector.

6. Conclusion

In the attempt to answer the research question:

- What characterizes the municipalities' capabilities to benefit from investments in information technology, and what major challenges must be overcome to do so?

we suggest that productivity gains are difficult in the municipalities because of the lack of task and technology control and limited IT management capabilities, and that these challenges are not easily dealt with because they are caused by fundamental characteristics of the way service processes are designed and managed, and how IT is developed and acquired.

Besides providing these specific findings, the research contributes by illustrating how IT business value models might be used to analyze IT value creation in a specific domain, and how systems development methods might be used to systematically analyze organizational processes during research.

Our research has limitations in that it is based on data from only two municipalities. However, the identified challenges are similar across the studied processes and organizations.

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